

**Title of the invention**Methods and terminal devices**Field of the invention**

5 The invention relates to transmitting and indicating location information

Background of the invention

10 Push-to-Talk over Cellular, PoC, is a relatively new service offered in some cellular networks, and gains gradually more success on the market. In PoC, one subscriber can transmit speech to another subscriber or a group of subscribers simply by pressing a speak button. The transmission is half-duplex only, i.e. only one party can speak at a time.

15 The communication channel between the parties of the conversation is usually a packet-switched communication channel which is preferably established at the very beginning of the service. As a consequence a speech message, comprising speech coded at the terminal device, can usually be
20 transferred almost instantaneously without an annoying delay due to the establishment of the packet switched communication channel between the individual speech messages that are to be transmitted.

25 A user receiving a Push-to-Talk over Cellular message cannot know the geographical location of the talking party without asking it from the speaker, which is time-consuming and, when PoC is used as a group service, can be annoying to the others who then hear the reply as well.

Summary of the invention

An objective of the invention is to enable a party of a conversation to obtain location information of another party in a convenient way.

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This objective can be achieved with a method as described in claim 1 for receiving the location information, and as described in claim 3 for transmitting the location information.

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Dependent claims 2 and 4 to 7 describe various advantageous embodiments of the invention.

The objective of the invention can also be achieved with a terminal device in accordance to any one of claims 8 to 14.

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Advantages of the invention

If the geographical location information is received at a terminal in a message that indicates that a user of another terminal device has pressed a talk button, it is clearly advantageous that one party of the conversation does not need to ask the other party about his or her whereabouts.

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Furthermore, the geographical location information may become important for the recipient only at the point when the user of the other terminal device is going to say or is saying something - and has therefore pressed the talk button. In this manner it can be ensured that the user obtains the geographical location when he or she needs it or has any interest in it, not too early or too late.

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Indicating the geographical location can be performed in many ways. Especially useful this is if the geographical location is indicated to the user of the terminal device in relation

to his or her own geographical location. This helps the party receiving the speech message to sense the direction where the speech is actually coming from. This may improve the user's feeling of mutual understanding, or help to locate the other user in a crowded area. Especially advantageous embodiments for carrying out this feature are: indicating a direction of the terminal device from the geographical location of the other terminal device; indicating a distance of the terminal device from the other terminal device; indicating the geographical location of the terminal device on a map together with the location of the other terminal device; and indicating the coordinates of the terminal device and of the other terminal device.

If the geographical location information is written into a message that is transmitted to another terminal device either directly or via a network, it is clearly advantageous that one party of the conversation does not need to tell the other party about his or her whereabouts.

Nevertheless, in order to avoid privacy problems and any conflicts with the legislator in some countries, it may become necessary to enable user control over the decision whether or not geographical location information may be sent.

Therefore, by setting a parameter controllable by a user of the terminal device, sending the geographical location information can be disabled or enabled. In this manner, it is also possible to use e.g. the PoC service without revealing the address.

Furthermore, if the parameter controllable by a user of the terminal device shows that the geographical location may be indicated to another device to which the message, or any

message derived therefrom, is going to be sent, partial
anonymity can be guaranteed. In this manner, e.g. parents may
ensure that the child's geographical location is transmitted
to parents and/or trusted friends only, but not to unknown
5 people that might cause harm to the child.

Common to all embodiments is that if the message is a message
that would in any case be sent to the other party, some
traffic can be avoided since no dedicated geographical
10 location messages need to be transmitted any more.

If the invention is used in connection with PoC, such
messages are then preferably Push-to-Talk over Cellular
messages. Some special cases of these messages are REFER
15 message, a Floor taken -message, or a Talk burst, since they
are sent in any case if a speech message is transmitted
between two terminal devices.

Short description of the drawings

In the following, the invention is described in more detail
20 with reference to the examples shown in the accompanying
drawings in Figures 1A to 6B, of which:

Figure 1A shows a modern network architecture for enabling
the PoC service;
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Figure 1B shows a simplified functional block diagram of a
terminal device;

Figure 2 illustrates the implementation of the PoC service;
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Figure 3 shows an exemplary signalling diagram for PoC;

Figures 4 and 5 show more detailed signalling diagrams for PoC;

Figure 5 is another model case for PoC; and

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Figures 6A and 6B illustrate possible structures of the message carrying geographical location information.

Same reference numerals refer to similar elements throughout the Figures.

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Detailed description of the invention

Figure 1A shows a modern network architecture for enabling the PoC service. A terminal device 101, sometimes denoted as user equipment, such as a mobile terminal or a portable digital assistant, can be in a wireless connection with a communications network 100 or with another terminal device.

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The communications network 100 may comprise a GSM/EDGE Radio Access Network 103 which is further connected to Circuit-Switched Core Network 105 and Packet-Switched Core Network 107. The latter is further connected to IP-based Multimedia Subsystem IMS 109 which resembles more or less Internet. The PoC service can be located in Internet 111 or in any IP-based network.

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Figure 1B shows a simplified functional block diagram of a terminal device 101. The terminal device 101 comprises receiving means 151, transmitting means 153, processing unit 155, memory 161, voice input means 157 and voice output means 159, visual indication means 163, and push button 167. The processing unit can run application 165 for offering the PoC service.

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The receiving means 151 and transmitting means 153 may enable the terminal device 101 to be in communication with the communications network 100 or with another terminal device.

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An example of voice input means 157 is a microphone, and of voice output means 159 a loudspeaker. A skilled person appreciates that some very essential components - e.g. rechargeable battery or any other energy source, amplifiers, antennas etc. - have been omitted from Figure 1B for clarity. These features are nevertheless rather well known *per se* so omitting does not make understanding the invention any more difficult.

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Figure 2 illustrates the implementation of the PoC service. The Packet-Switched Core Network 107A, through which the terminal device 100 can have its connections, is connected to the IMS 109A. Most messages are routed via IMS core 203A. The PoC server 201 can be in Internet 111.

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Another terminal device can be either connected to the same Packet-Switched Core Network 107A or to another Packet-Switched Core Network 107B, e.g. of another communications network 100B. The Packet-Switched Core Network 107B is

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connected to IMS 109B which further comprises IMS Core 203B. The IMS 109A may communicate with IMS 109B either directly or via Internet 111.

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Figure 3 shows an exemplary signalling diagram for PoC. The user at the terminal device 101 presses the talk button 167. The terminal device 101 sends a request to the PoC server 201 which is in "Floor idle" state (step 301). The PoC server 201 notifies the other terminal device 101B by sending a

notification J13, grants the floor and notifies the terminal device 101 by sending an acknowledgement J15. Then the terminal device 101 signals the user Talk proceed-notification, e.g. by alerting the user with voice output means 159. The user starts speaking, and speech received by voice input means 157 is coded and transmitted in packets M11, M21, M31, M41, ..., M51 to the PoC server 201 which further forwards the messages to the other terminal device 101B as packets M12, M22, M32, M42, ..., M52.

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The user can speak as long as the talk button 167 is pressed. After releasing the talk button 167, the terminal device 101 signals the release of the talk button to the PoC server 201 by sending a message J21. The PoC server 201 notifies the other terminal device 101 by sending a message J23, and then sends an acknowledgement J25 to the terminal device 101. Then the PoC server 201 returns to Floor Idle -state, as designated with step 301.

20 Figure 4 and 5 show more detailed signalling diagrams for PoC.

Figure 4 shows a case where both terminal devices have enabled so-called early session and automatic answer.

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Dashed box 41 shows how a session is created. When terminal device 101 is switched on, it sends a SIP INVITE message to IMS core 203A which further forwards the message to PoC server 201 which responds with SIP 200 OK that is forwarded by the IMS core 203A to the terminal device 101. The terminal device 101 responds with an acknowledgement SIP ACK. The other terminal 101B performs similar messaging with the PoC server 201.

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Dashed box 43 shows how a PoC is then used. When the talk button 167 is pressed at a terminal device 101, the terminal device 101 sends message J11 that is a SIP REFER message. The
5 IMS core 203A forwards message J11 to PoC server which transmits message J13 that is RTCP: Floor taken message to the other terminal device 101B. The other terminal device 101B indicates that it is now listening the terminal device 101, e.g. by playing a suitable acoustic signal.

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The PoC server 201 responds with message J15 that is RTCP: Floor Granted. Then the terminal device 101 indicates to the user that he or she can now talk, e.g. by playing a suitable acoustic signal. The PoC furthermore sends a SIP 202 message
15 to the terminal device 101.

Speech packets MN1 coded at the terminal device 101 are transmitted as RTP: Talk bursts through the IMS core 203A to the PoC server 201. The PoC server 201 forwards them as
20 speech packets MN2, transmitting them as RTP: Talk bursts to the other terminal device 101B through the IMS core 203B. The other terminal device 101B receives the speech packets MN2, decodes them, and converts them to an audible form so that the user of the other terminal device 101B can hear a
25 reproduction of the speech coded by the terminal device 101.

When talk button 167 is released at the terminal device 101, the terminal device sends message J21 that is RTCP: Floor release -message. The PoC server 201 sends message J23 that
30 is RTCP: Floor idle message to the other terminal device 101B. The other terminal device indicates the user that the floor is now idle, i.e. that he or she may press the push button 167 of his or her terminal device 101B.

The PoC server 201 responds with SIP NOTIFY, and the terminal acknowledges by sending SIP 200 OK message. The PoC server 201 responds once more by sending message J25 that is RTCP: Floor idle message.

Figure 5 is shows late media and manual answer for one-to-one-communication using PoC. Now responsive to terminal device 101 detecting a pressing of talk button 167, it sends message J11 that is SIP INVITE, to IMS core 203A. The IMS core 203A forwards the SIP INVITE to PoC server 201 that sends message J13 that is SIP invite to IMS core 203B, The IMS core 203B forwards the SIP INVITE to the other terminal device 101B, and passes SIP 100 Trying message to PoC server which forwards it through IMS core 203A to the terminal device 101.

Upon receiving SIP INVITE, the other terminal device 101B indicates that a talk is intended, e.g. by playing a suitable audible signal, and passes SIP 180 Ringing message through IMS core 203B, PoC server 201, and IMS core 203A to the terminal device 101. The terminal device 101 alerts the user.

When a user of the other terminal device 101B accepts the talk, e.g. by pressing a suitable button, the other terminal 101B transmits SIP 200 OK message through the IMS core 203B to the PoC server 201 which then sends message J15 which is RTCP: Floor granted message to the terminal device 101. The SIP 200 OK is furthermore passed to the terminal device 101, after which the terminal device 101 alerts the user. Some acknowledgements and other SIP messages can furthermore be transmitted. The transmission of speech packets in messages MN1 and MN2 takes nevertheless place in a very similar manner than in the example discussed with reference to Figure 4.

Figures 6A and 6B illustrate possible structures of the message carrying geographical location information. The message can be J11 (signalling from terminal device 101 to the PoC server 201 that a talk button 167 has been pressed), M11 (any speech packet or especially the first speech packet from the terminal device 101), J13 (signalling from PoC server 201 to the other terminal device 101B that a talk button 167 has been pressed at the terminal device 101), or M12 (any speech packet or especially the first speech packet from the PoC server 201 to the other terminal device 101B).

The first terminal device 101 finds out its geographical location 65. For doing this, it may use any suitable locationing method. Currently, terminal devices with assisted Global Positioning System A-GPS receivers are under development. A-GPS enables quick & accurate location finding for the terminal device.

When the user of the first terminal device 101 pushes the talk button 167 in order to use the push-to-talk service, the first terminal device 101 requests the network for a permission to speak, and finally the push-to-talk message is generated by coding microphone input. The request for a permission to speak (message J11) or any of the speech messages (MN1, especially M11) can comprise the geographical location information 65.

As shown in Figure 6A, the push-to-talk message J11, M11, J13, or M12 may comprise a flag 63 "location information present" in the header field 61 indicating that the geographical location 65 follows. As an alternative, as illustrated in Figure 6B, the least-significant bits of the

speech message 64 comprising coded speech can be used to indicate the geographical location 65. The latter possibility enables a proprietary solution.

5 The other terminal device 101B receives the push-to-talk message. After checking the flag 63 in the header field 61 or the least significant bits 65, an application - e.g. the PoC application 165 - extracts the geographical location information 65.

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The other terminal device 101B knows its own geographical location 65B.

The other terminal device 101B compares its own geographical
 15 location 65B with the geographical location 65 of the terminal device 101. Information based on a comparison result is shown to the user of the other terminal device 101B. This information may comprise any of the following: direction of the terminal device 101 (may require use of a digital compass
 20 in the other terminal device 101B); distance of the terminal device 101 from the other terminal device 101B; show on a map the geographical location 65 of terminal device 101 vs. own geographical location 65B; or just displaying the geographical location 65 of terminal device 101 vs. own
 25 geographical location 65B.

It is by no means necessary that the geographical location 65 is received as such at the other terminal device 101B. The other terminal device 101B may transmit - e.g. by responding
 30 to any one of messages J13 or MN2 (esp. M12) - its own geographical location 65B to a network unit, e.g. to the PoC server 201 which then computes the difference and transmits

information based thereon to both the terminal device 101 and the other terminal device device 101B.

5 The terminal device 101, e.g. in one of its applications, such as the PoC application 165, can have a settings menu for setting a "push-to-talk" item, under which a user can tick on/off the following items:

- send own location with push-to-talk; and
- show talking party's direction/location.

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In other words, the user sending his/her own location has a full control over whether or not the location is to be sent, or, as described above, the parents or e.g. employer can control the transmission of the geographical location

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information.